

Notice of Allowability

Application No.

10/798,174

Examiner

Shane M. Thomas

Applicant(s)

CHOLLETI ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to After Final Amendment filed 12/11/2006.
2. ☒ The allowed claim(s) is/are 15,18 and 20-27 (renumbered 1-10).
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached.
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Leonard Heyman (Reg. No. 40,418) on 12/28/06.

Claims 23-27 have been amended as follows:

23. A computer readable medium storing program instructions for copying data from a first physical page in a memory that is directly accessible to input/output devices to a second physical page in the memory, the program instructions comprising:

program instructions for each input/output device causing the input/output device to first register an access to the memory by a physical address of the memory prior to the access of the memory, the input/output devices registering the access by recording a source of data in the memory being accessed and the physical address of each physical page of the memory being accessed, the recording being made in a page mapping structure;

program instructions for obtaining a lock on a page mapping structure corresponding to the first physical page thereby preventing new accesses to the first physical page by one of the input/output devices;

program instructions for disabling access by registered devices to the memory by signaling the registered devices to halt access to physical address space, the registered devices being devices that have registered for access to the first physical page using the page mapping

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structure;

program instructions for copying the data from the first physical page to the second physical page; and

program instructions for enabling access to the second physical page in the memory, by signaling the registered input/output devices to resume accessing the physical address space and by releasing the lock on the page mapping structure.

24. The computer readable medium of claim 23, further storing program instructions for disabling application memory access prior to the copying.

25. The computer readable medium of claim 23, wherein the copying of the page includes updating a record in the page mapping structure.

26. The computer readable medium of claim 23, wherein the signaling of the registered devices to halt access includes accessing a pre-relocation method and the signaling of the registered devices to resume accessing the physical address space includes accessing a post-relocation method.

27. The computer readable medium of claim 23, wherein the input/output devices access the memory via direct memory access.

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance:

The amendment to claims 15 and 23 overcomes the 35 U.S.C. §112, second paragraph, rejections of claims 15,18, and 20-27.

Applicant's arguments, see pages 6-10, filed 12/11/2006, with respect to the §103 rejections have been fully considered and are persuasive. The §103 rejections of claims 15,18, and 20-27, have been withdrawn.

As per Applicant's first argument (page 7 of the response), the Examiner acknowledges that the within the incorporation of the claims' preamble, the claims adequately claim I/O devices *directly accessing* a memory.

As per Applicant's second argument (page 8), the Examiner acknowledges that upon considering the argument, Arndt does not specifically teach the I/O device itself performing the steps to register the access to the memory before accessing the memory where the registering includes recording a source of data and the physical address being accessed. Arndt teaches that the hypervisor 170 - not the I/O devices - is responsible for updating the registration of memory accesses of the I/O devices (via TCE table 175) and maintaining memory coherency [4/8-11]. Rogers does make up for these deficiencies of Arndt. Additionally regarding claim 23, Arndt does not specifically teach program instructions *for each* I/O device causing the registering to happen.

As per Applicant's third argument (page 9), The Examiner agrees with the Applicant's assessment with regards to the ability of the Arndt reference to be able to regulate the accesses of

the TCE table 175 without the use of locks as taught by Rogers since the hypervisor 170 is taught as being responsible for maintain memory coherency [4/8-11].

The Examiner also incorporates Swanberg (U.S. Patent Application Publication No. 2004/0064601) into the prior art of record. Swanberg teaches a migration (copy) method for relocating physical pages of a memory in figures 5A and 5B. While, the method teaches disabling (step 514, ¶5) and enabling (step 522, ¶7) access to the physical pages being migrated, Swanberg does not specifically teach or suggest I/O devices registering an access to the memory pages via a source of data in the memory being accessed and the physical address of the page(s) to be accessed in a page mapping structure. Also, locking only occurs for the physical addresses (not the mapping structure) when allocating the addresses (see figures 3,4, and 6).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shane M. Thomas whose telephone number is (571) 272-4188. The examiner can normally be reached on M-F 8:30 - 5:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt M. Kim can be reached on (571) 272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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